

科目：電子學甲 適用：電機所電子組

編號：421

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. For the circuit shown in Fig. 1, find the labeled node voltages for $\beta = \infty$. (10 points)
2. Assuming $\beta = 100$, find the voltage gain v_o/v_i and the input resistance R_i of the amplifier shown in Fig. 2. (20 points)

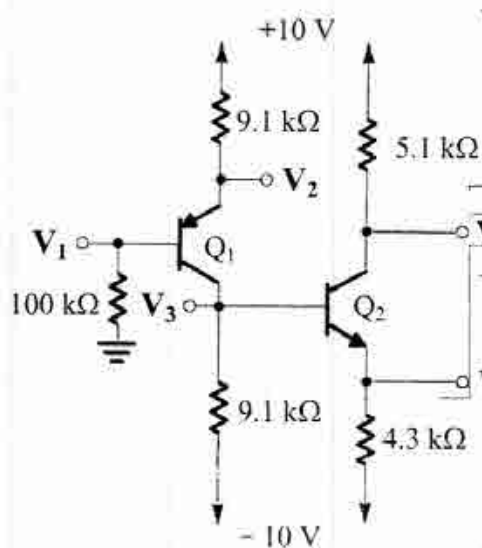


Fig. 1

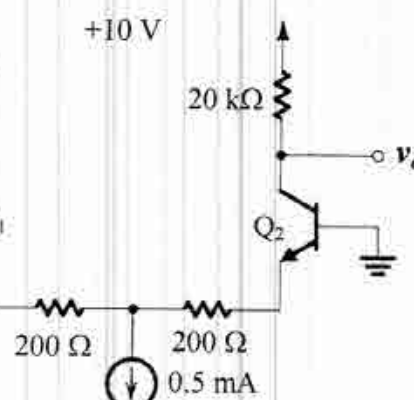


Fig. 2

3. Assuming the op amp to be ideal, express v_o as a function of v_1 and v_2 for the circuit shown in Fig. 3. What is the input resistance seen by v_1 alone? By v_2 alone? (20 points)

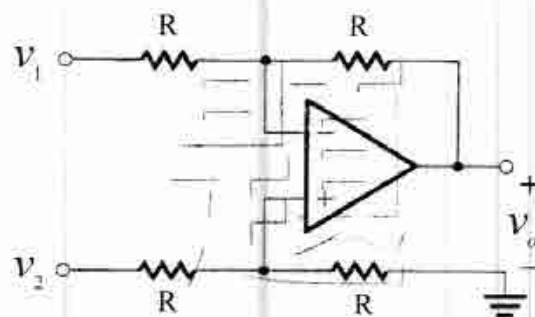


Fig. 3

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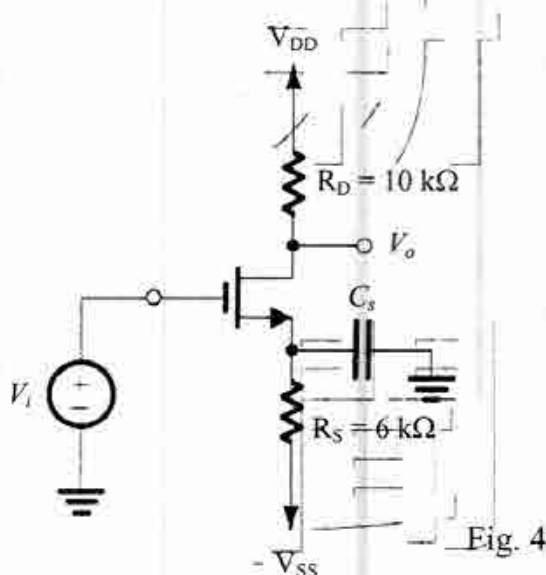
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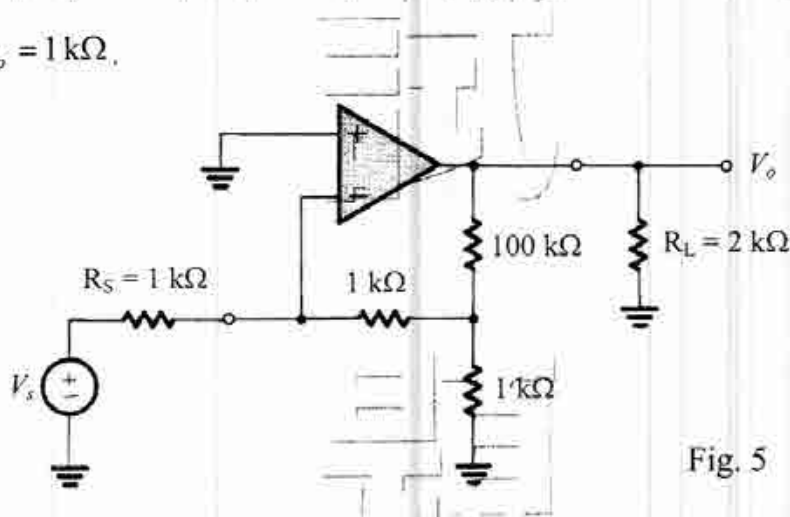
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4. The amplifier in Fig. 4 is biased to operate at $I_D = 1 \text{ mA}$ and $g_m = 1 \text{ mA/V}$.

Neglecting the output resistance r_o , find the midband gain. (20 points)



5. For the circuit shown in Fig. 5, use the feedback method to find the voltage gain V_o/V_s . The op amp has open-loop gain $\mu = 10^4 \text{ V/V}$, $R_{id} = 100 \text{ k}\Omega$, and $r_o = 1 \text{ k}\Omega$. (20 points)



6. Estimate the total charge stored in a $0.1\text{-}\mu\text{m}$ depletion layer on one side of a $10\text{-}\mu\text{m} \times 10\text{-}\mu\text{m}$ junction. The doping concentration on that side of the junction is $10^{16}/\text{cm}^3$. (10 points)